



INSTRUCTION TO SERVICE

ITS: 6201

SECTION:	294 Power Cables.
WRITTEN BY:	K. Baziuk
SUBJECT:	Rework BAE HV PCS Cable Routing.

ITS6201

Draft

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INSPECTION PROCEDURE:

NOTE: Inspect all High Voltage cables for chaffing. If chaffing is found on any of the phase cables, replace the entire cable. Refer to the following BAE systems documents for termination instructions and cable component details:

"VPMS HIGH VOLTAGE HARNESS ICD", BAE DRAWING #115E3592 REV G OR HIGHER

HIGH VOLTAGE WIRE HARNESS, INSTALLATION SPECIFICATION, BAE DRAWING #M50GB3603

1. Turn the main battery disconnect switch to the "OFF" position.
2. Gain access to the HV cables that route in and around the transmission. Refer to Figure 1.

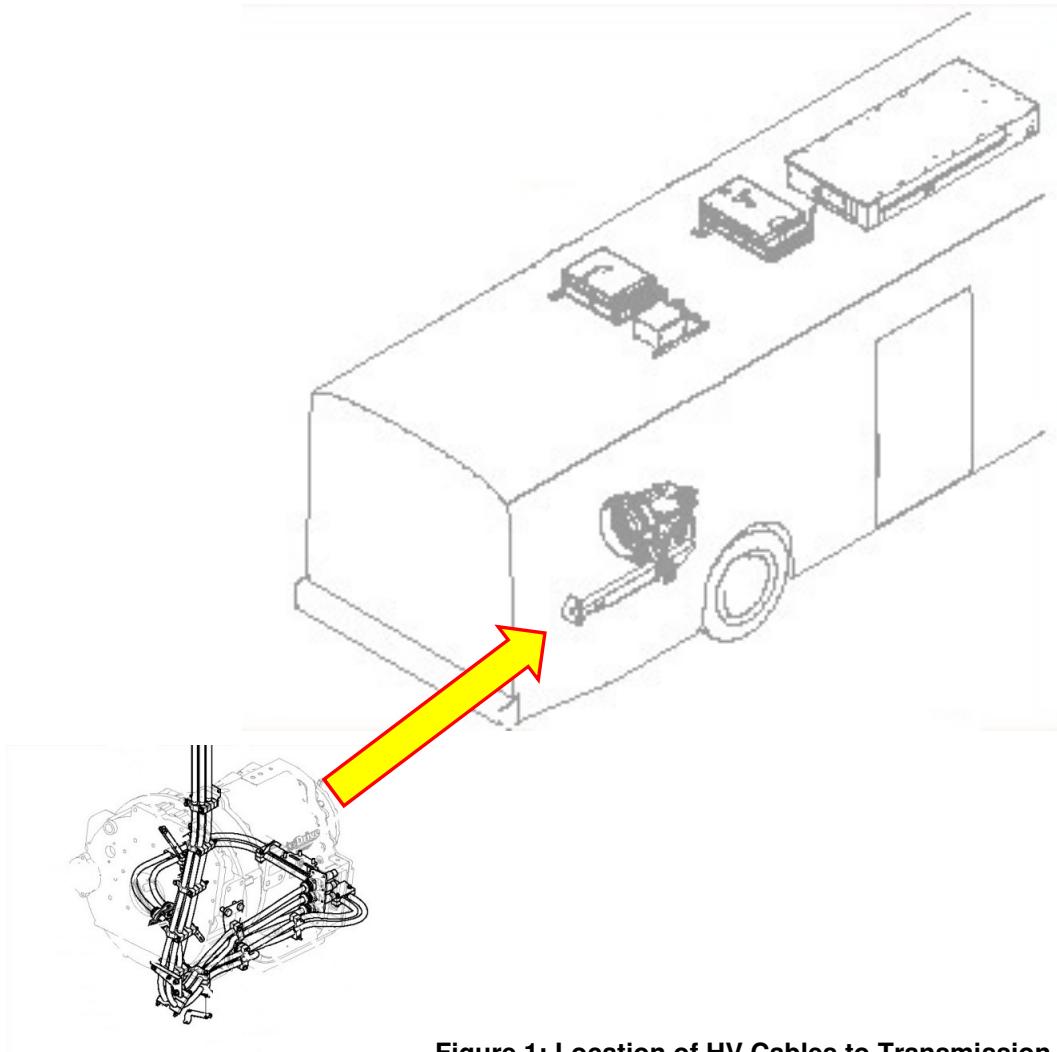


Figure 1: Location of HV Cables to Transmission.

3. If any phase cables require replacing, perform the following:
 - a. Remove the affected cable(s) in the entire length from end to end, Propulsion Control System (PCS) enclosure to the Integrated Starter Generator (ISG) box.

- b. **From the ISG end**, loosen and remove the M10 X 1.5 X 20MM bolts, lock washers and flat washers for the phase cable connections inside the ISG and set aside.
- c. Lubricate the O-rings with O-ring lubricant P/N: 400081, Qty 0.01 and install O-rings on phase cable assembly plates. Clean the phase connection ring terminals and ISG's terminal's mating surface with Isopropyl Alcohol, P/N: 134336, Qty 0.01. Clean the phase cable assembly plates and ISG housing's mating surface with Isopropyl Alcohol, P/N: 134366, Qty 0.01.
- d. Install the phase cable assembly plates into the ISG. Align the three phase connections with their appropriate terminals inside the ISG. Loosely mount the phase cable(s) to the terminal block using the M10 X 1.5 X 25MM bolts, lock washers and flat washers. Refer to Figure 2.
- e. Torque the M8 X 1.25 X 20MM side plate bolts to 31.0 +/- 3.1Nm (22.9 +/- 2.3 ft-lbs).
- f. Torque the M10 X 1.5 X 25MM phase connection bolts to 72.0 +/- 7.2Nm (53.1 +/- 5.3 ft-lbs).
- g. Verify the O-rings are installed on the junction box cover. Install the junction box cover with the M6 X 1.0 X 12MM bolts to the ISG. Torque the bolts to 11.0 +/- 1.1Nm (97.4 +/- 9.7 in-lbs)
- h. **From the PCS end**, loosen and remove the M5 X 0.8 X 16MM bolts on the HV interlock plate. Remove the interlock plate and set aside. Refer to Figure 3.
- i. Lubricate the O-rings with O-ring lubricant P/N: 400081, Qty 0.01 and install O-rings on phase cable assembly plates. Clean the phase connection ring terminals and PCS's terminal's mating surface with Isopropyl Alcohol, P/N: 134336, Qty 0.01. Clean the phase cable assembly plates and PCS housing's mating surface with Isopropyl Alcohol, P/N: 134366, Qty 0.01.
- j. Insert cable assembly into the appropriate slot in the PCS. Refer to Figure 4.
- k. Thread the M8 X 1.25MM X 16MM bolt into the phase connection terminal. Torque the bolt to 17.0 +/- 1.7 Nm (150.5 +/- 15.1 in lbs). Repeat for each phase.
- l. Thread the M5 X 0.8MM X 20MM bolts into the PCS. Torque the bolt to 4.0 +/- 0.4 Nm (35.4 +/- 3.5 in lbs).
- m. Install the interlock plate and thread the M5 X 0.8 X 16MM bolts into the PCS. Torque the bolt to 4.0 +/- 0.4 Nm (35.4 +/- 3.5 in lbs).

HV Cable Routing

- 4. Add Clamp, P/N: 247225, Qty 1, Clamp, P/N: 092589, Qty 1, Bolt, P/N: 10B04012, Qty 1 and Nut, P/N: 40N04000, Qty 1 to separate between rubbing engine harness/cable/lines. Refer to Figure 5, Detail C.
- 5. Add Clamp, P/N: 247223, Qty 2, Bolt, P/N: 10B04012, Qty 1 and Nut, P/N: 40N04000, Qty 1 to separate between rubbing engine harness/cable/lines. Refer to Figure 5, Detail D.
- 6. Add Clamp, P/N: 247223, Qty 2, Bolt, P/N: 10B04012, Qty 1 and Nut, P/N: 40N04000, Qty 1 to separate between rubbing engine harness/cable/lines. Refer to Figure 5, Detail E.
- 7. Ensure the HV cable are routed as per Figures 6, 7 and 8. Re-use all hardware related to clamping of power cables. Do not use Loctite on hardware unless specified. Minimum bend radius for power cables in all areas except between engine and chassis is 4 inches at cable centerline. Ensure there is NO WRINKLING of cable sheathing when bent. Minimum radius between engine and chassis is 6 inches.

8. Refer to New Flyer Drawing; 537264M for all details related to cable routing, clamping, termination and torqueing.
9. Turn the main battery disconnect switch to the “ON” position.

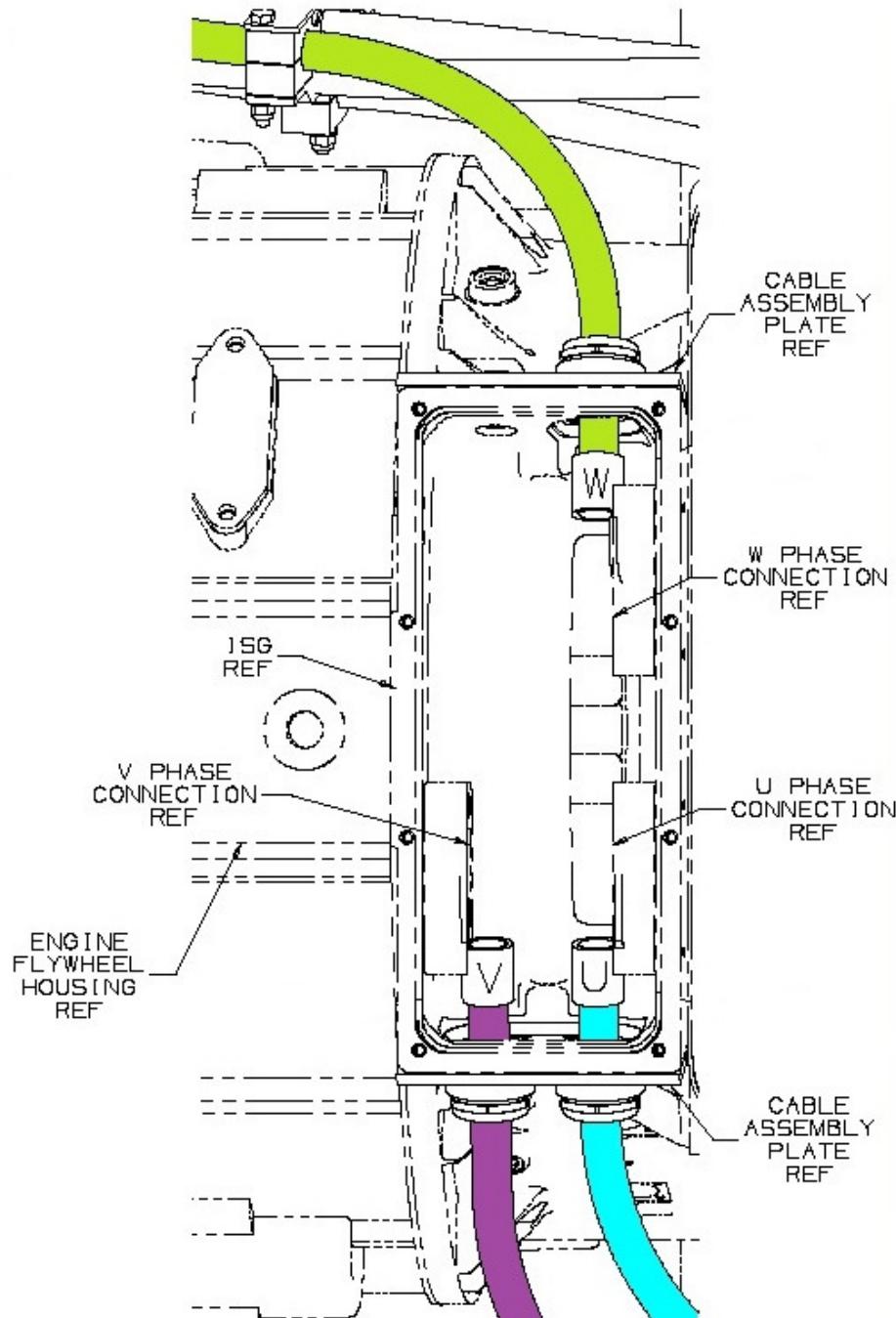


Figure 2: Integrated Starter Generator (ISG) Terminal Connections

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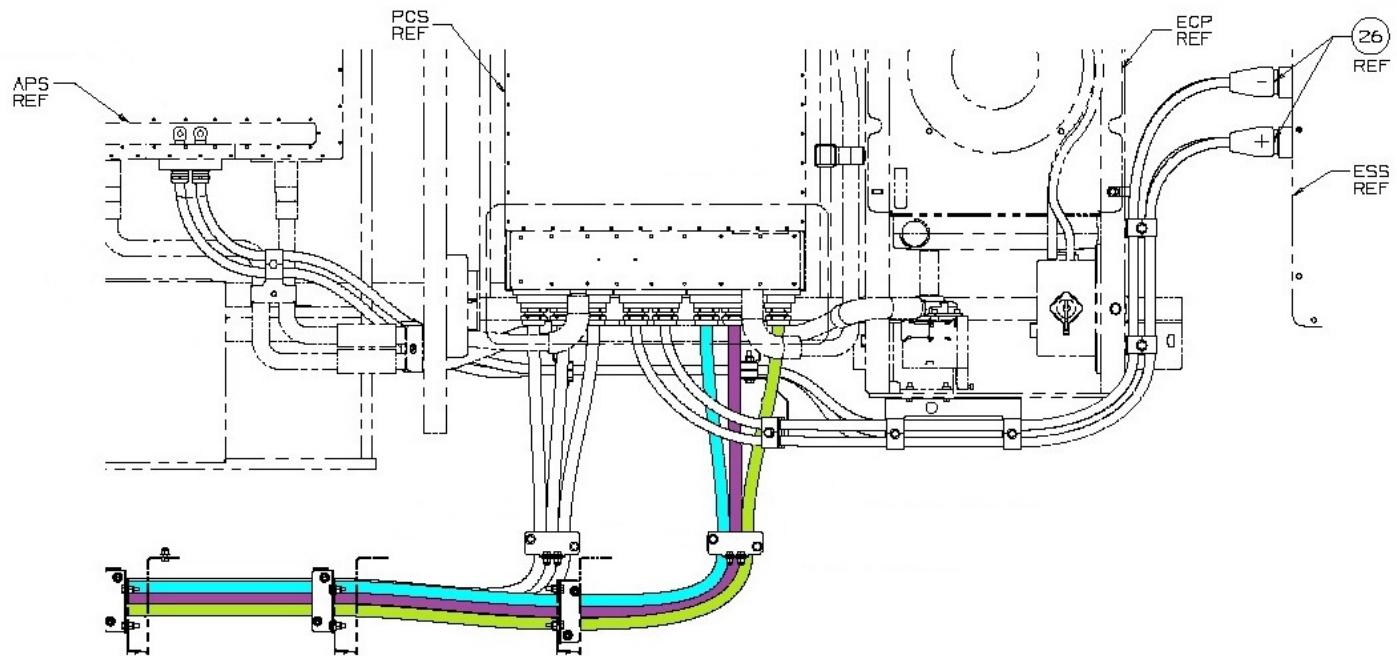


Figure 3: Propulsion Control System (PCS) Location on Roof

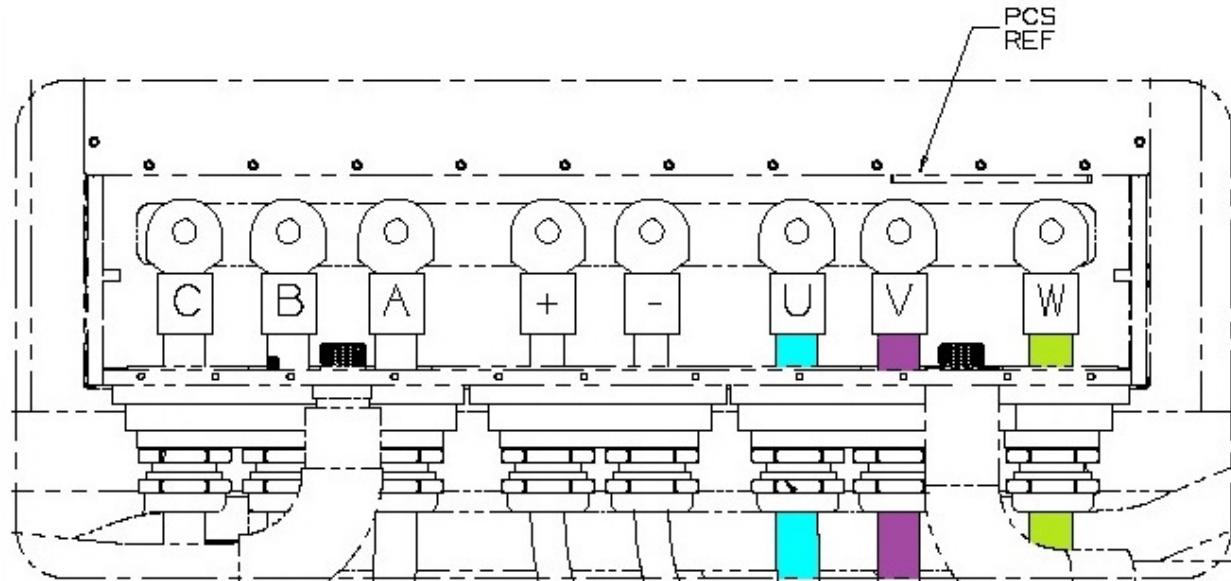


Figure 4: Propulsion Control System (PCS) Terminal Connections

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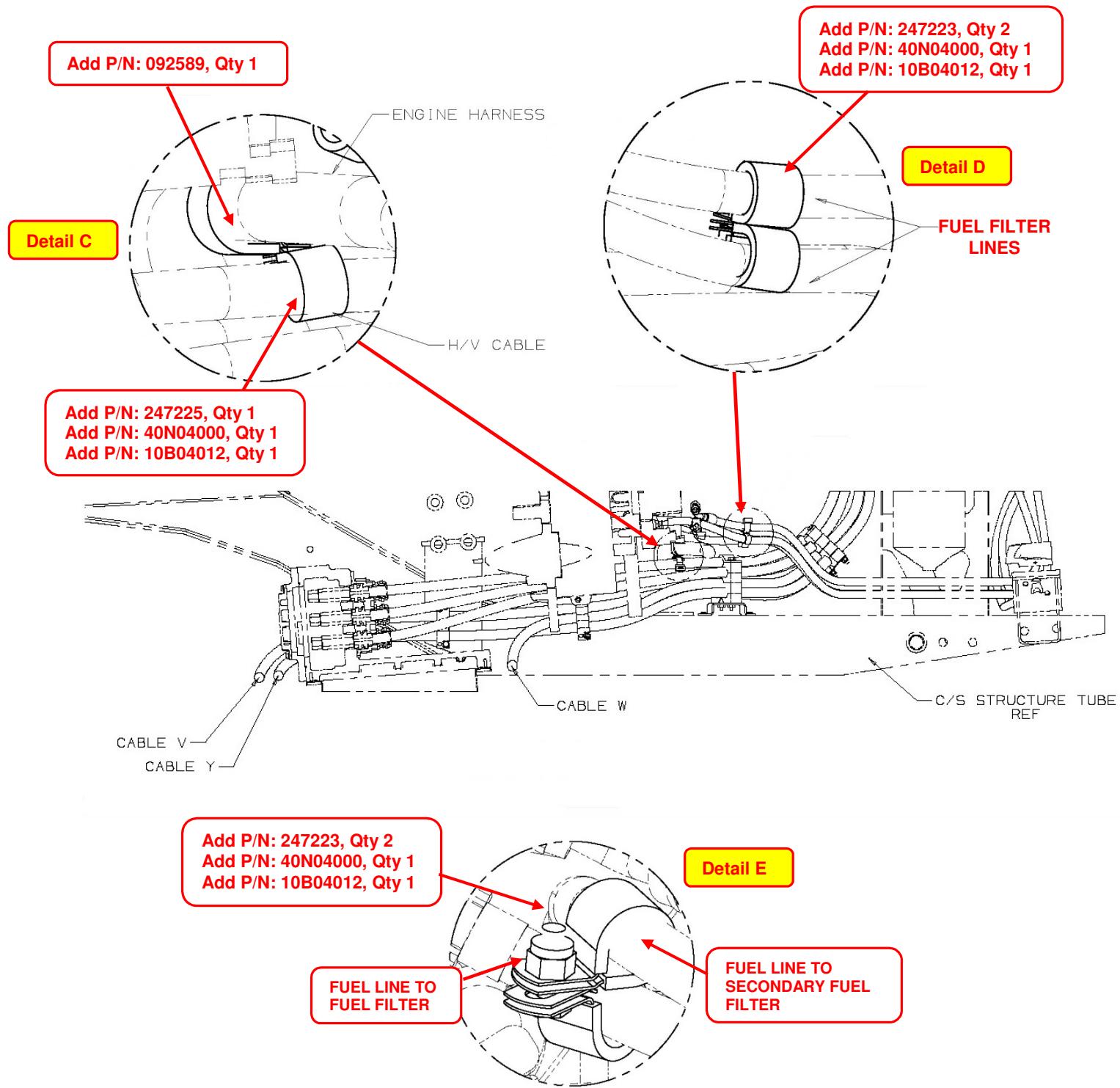


Figure 5: P-Clamp Mounting Details

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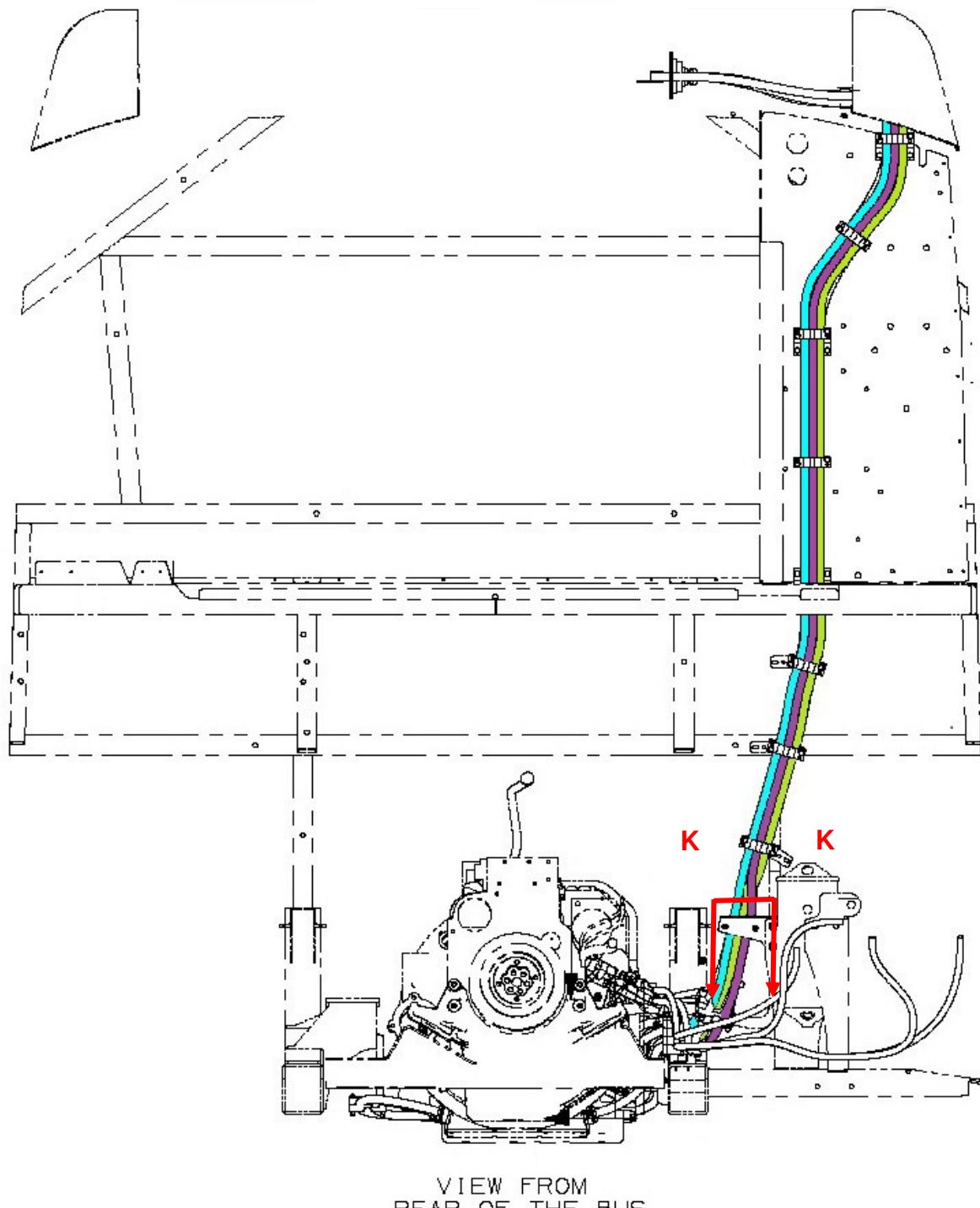
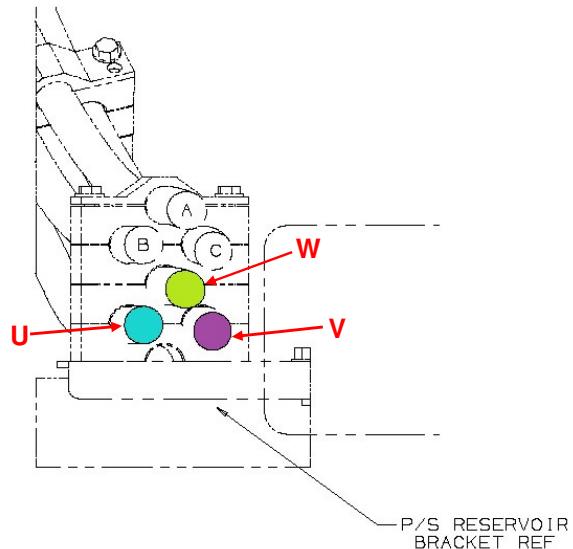
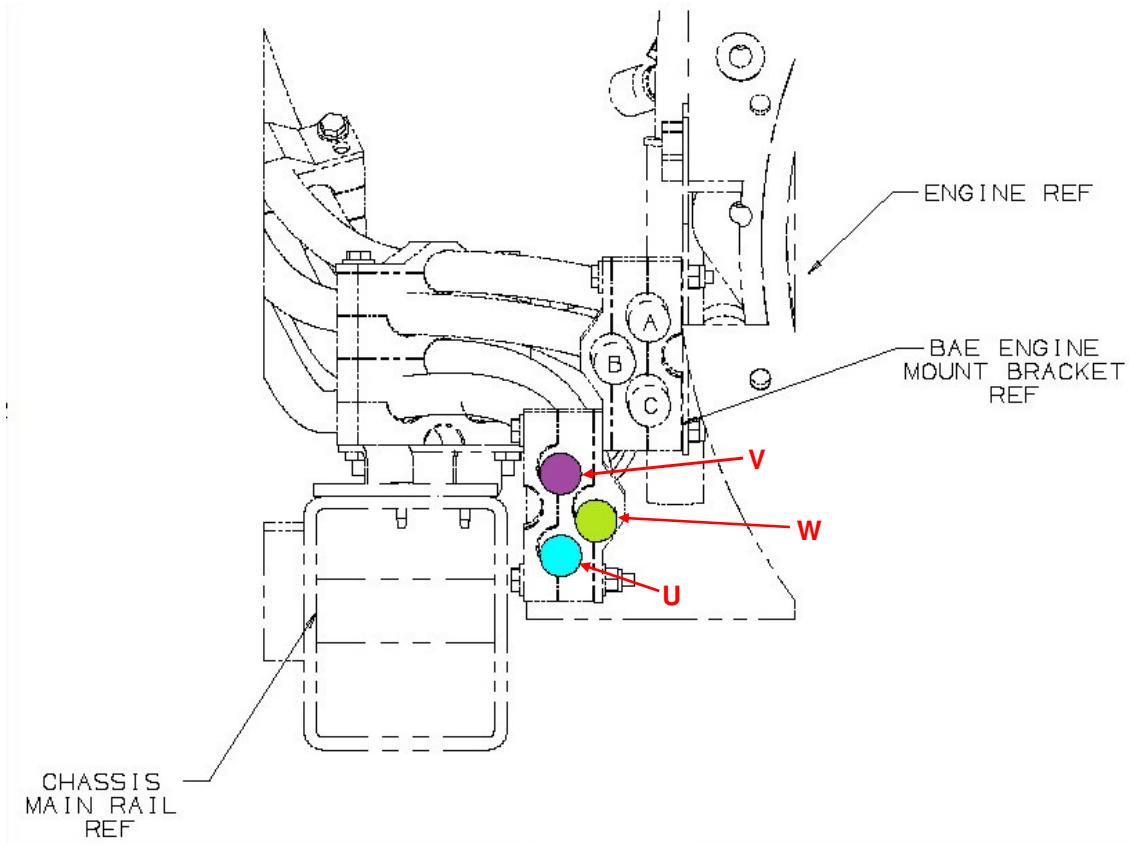


Figure 6: HV Cable Routing; Section K-K (below)

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Section K-K



Section J-J

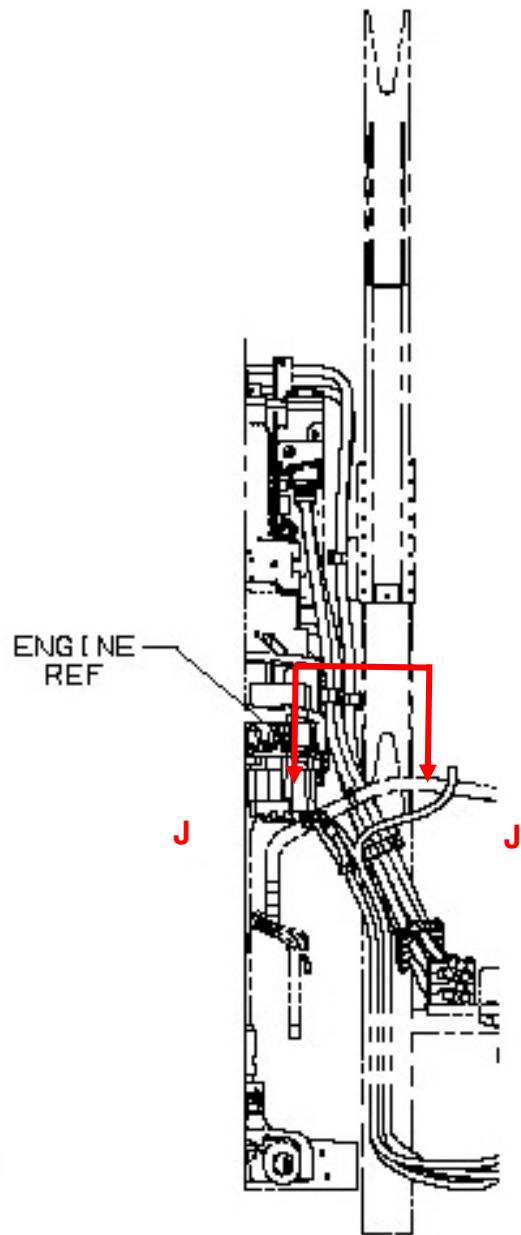


Figure 7: HV Cable Routing; Section J-J (above)

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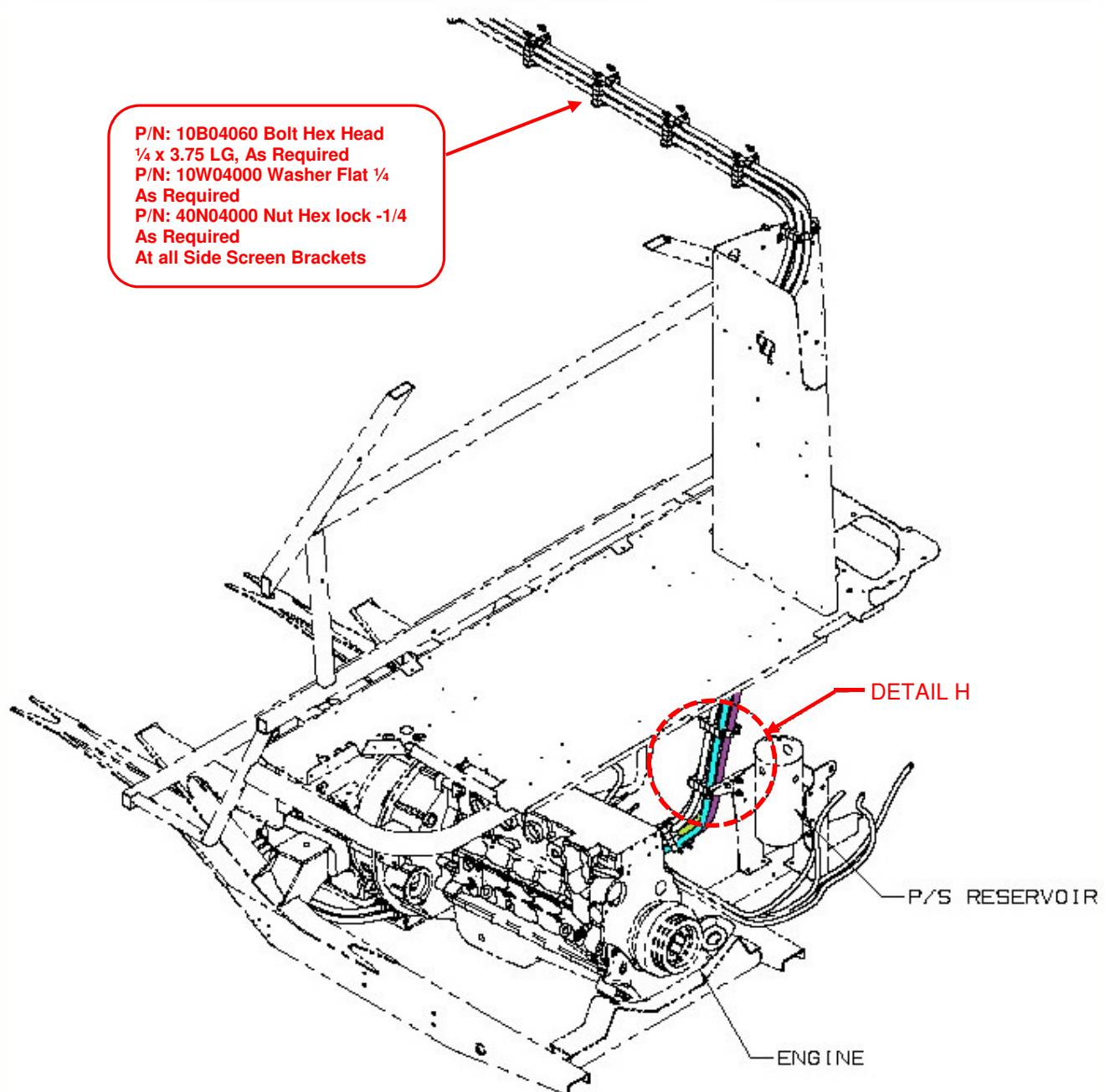
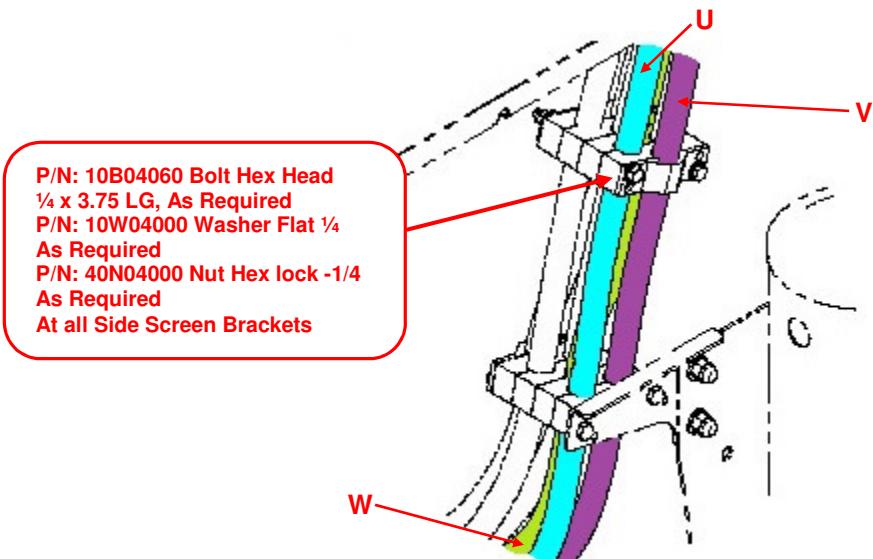


Figure 8: HV Cable Routing; Detail H (below)

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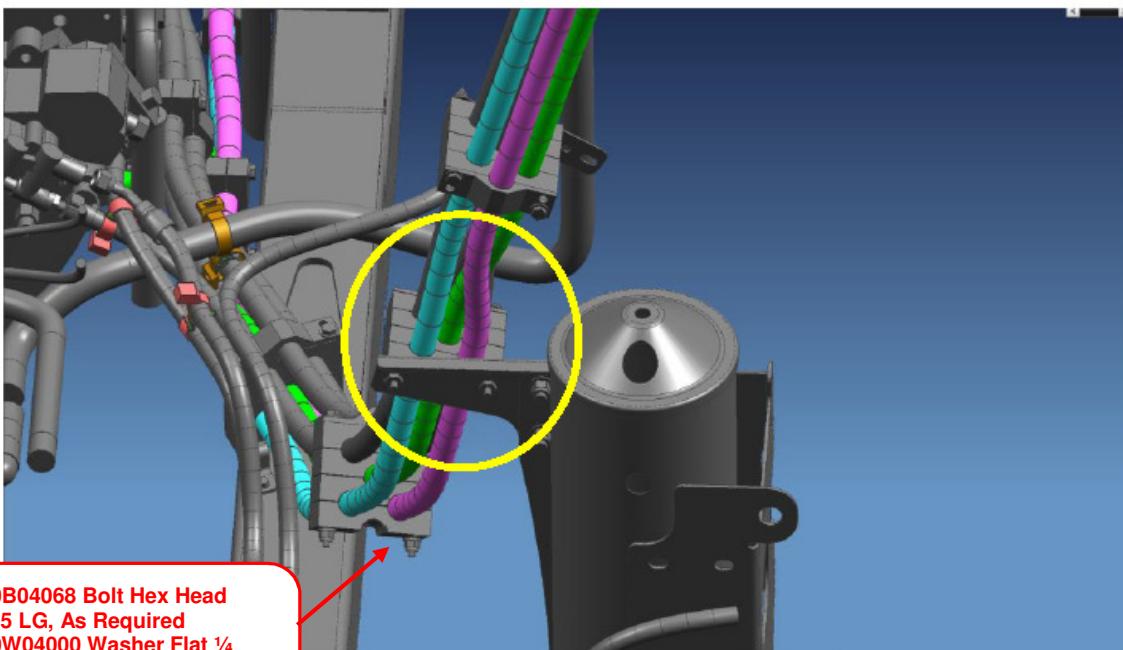


Detail H

Turquoise- cable U

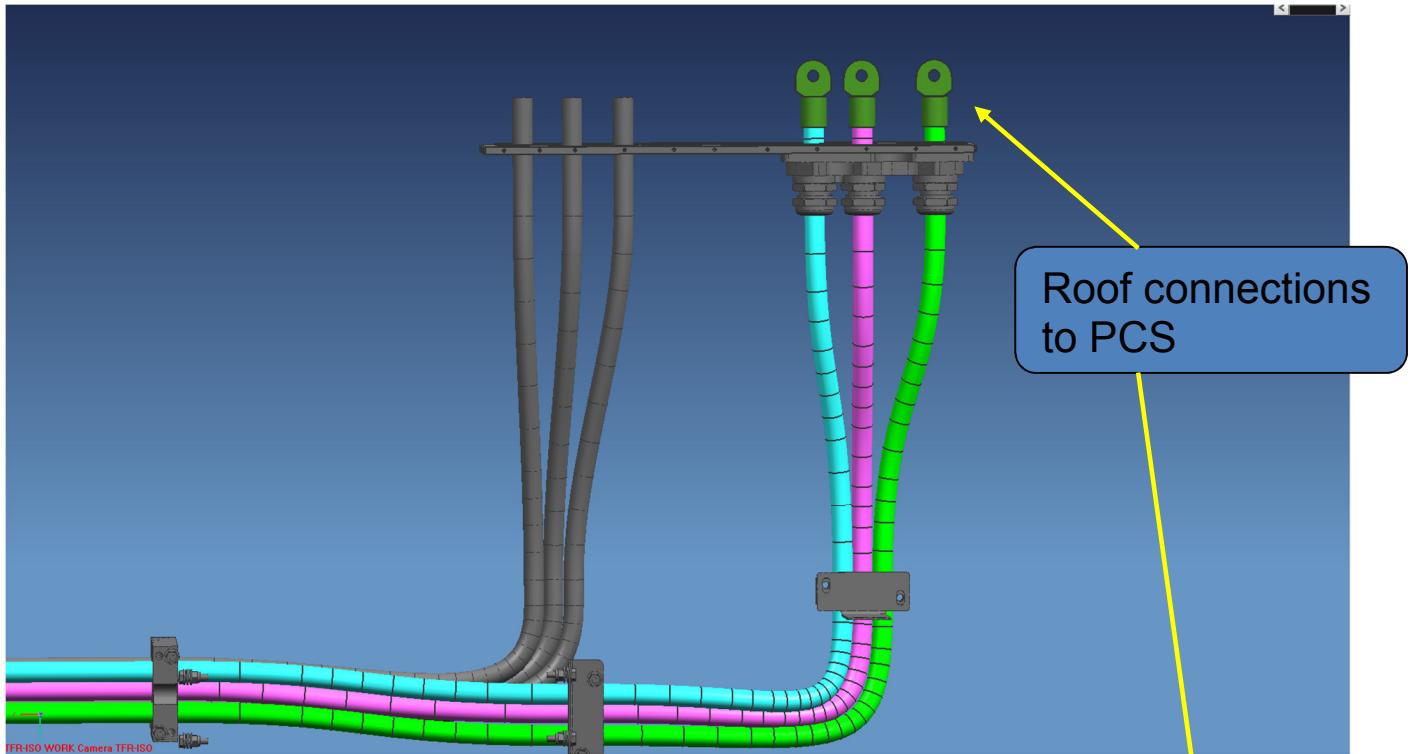
Purple- cable V

Green- cable W

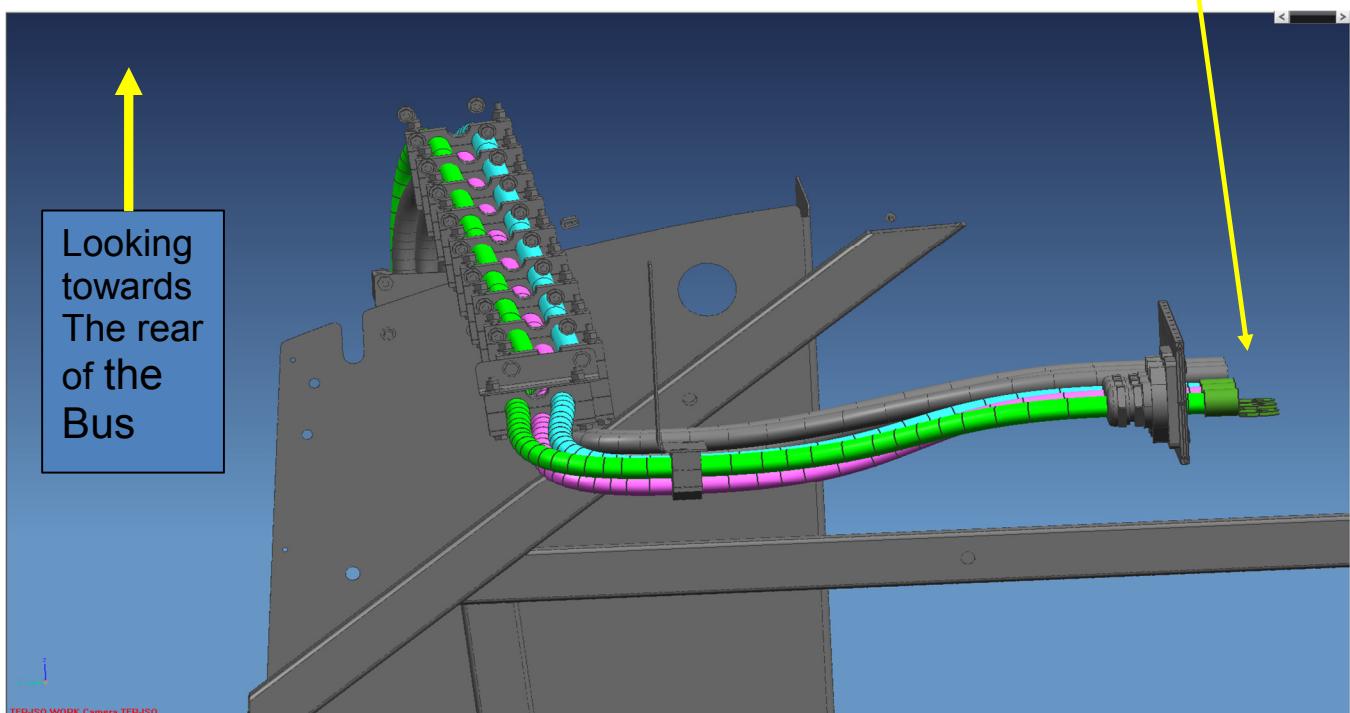


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FINAL ROUTING PHOTOS

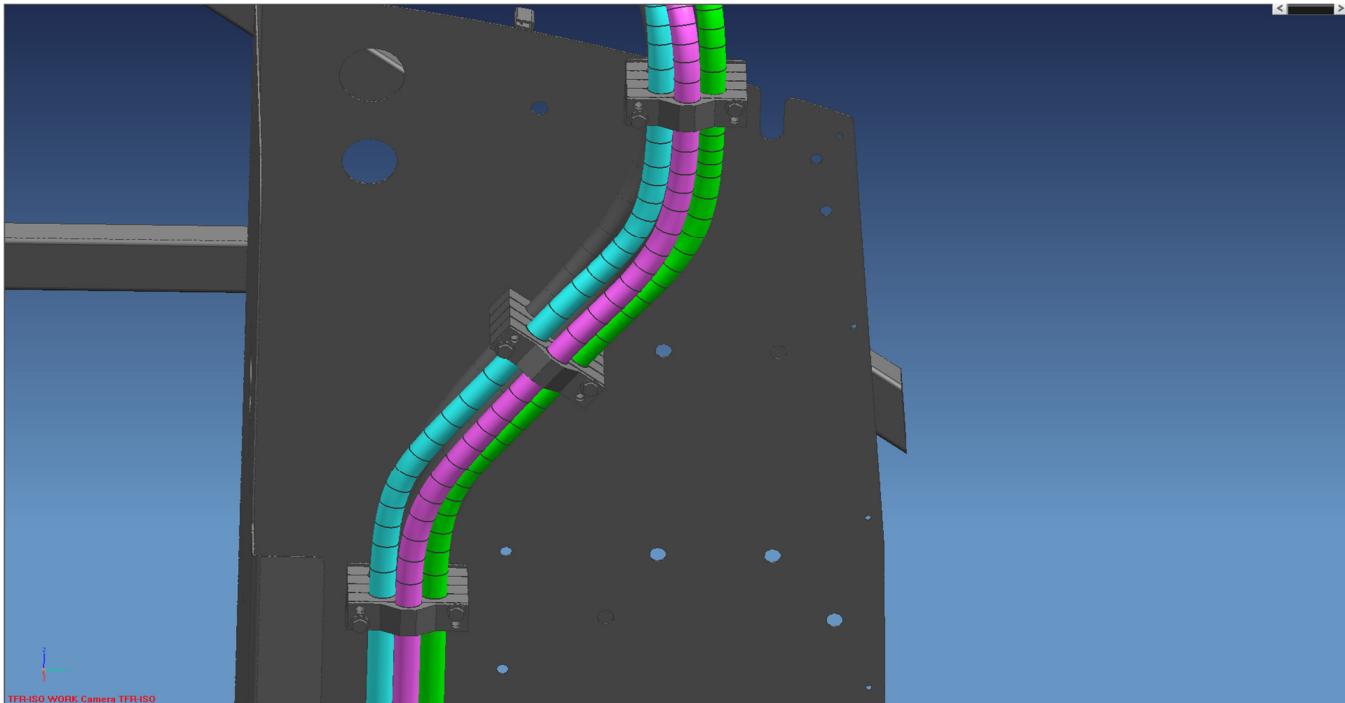


Routing to PCS

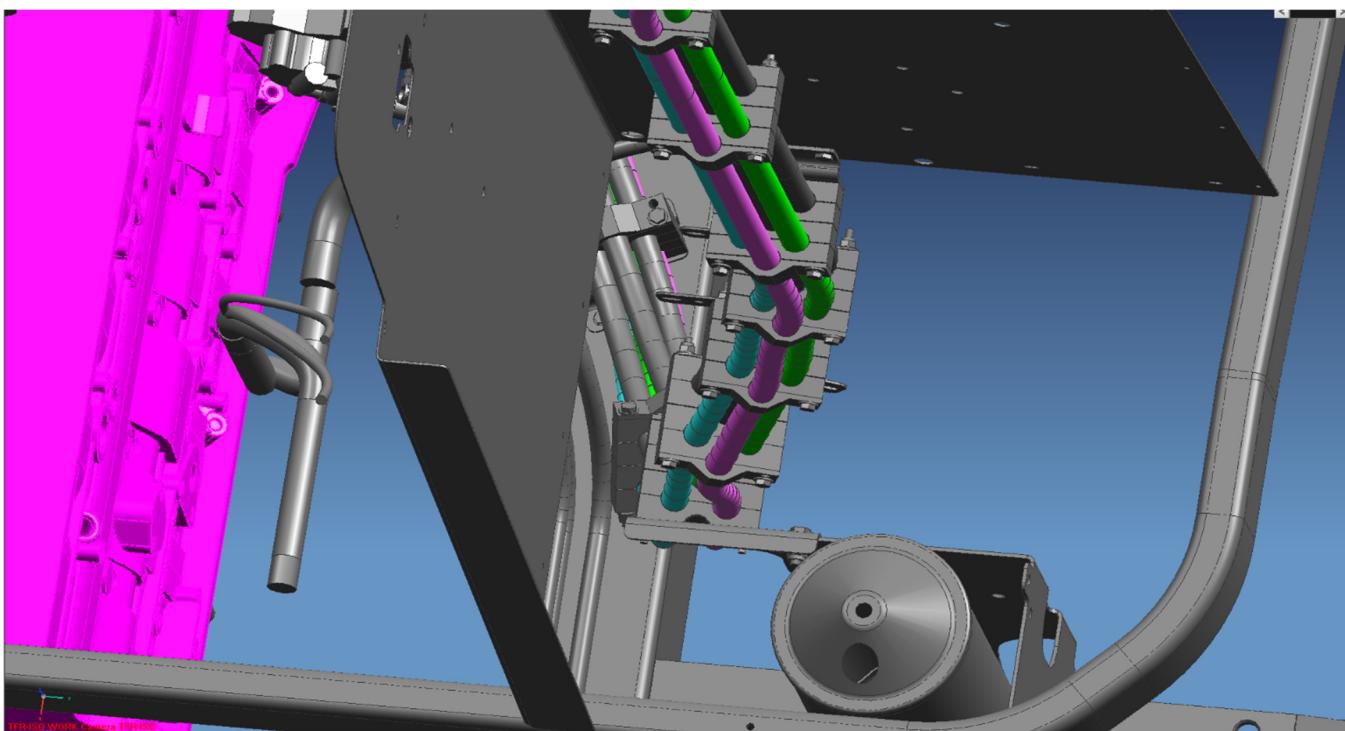


Routing from PCS

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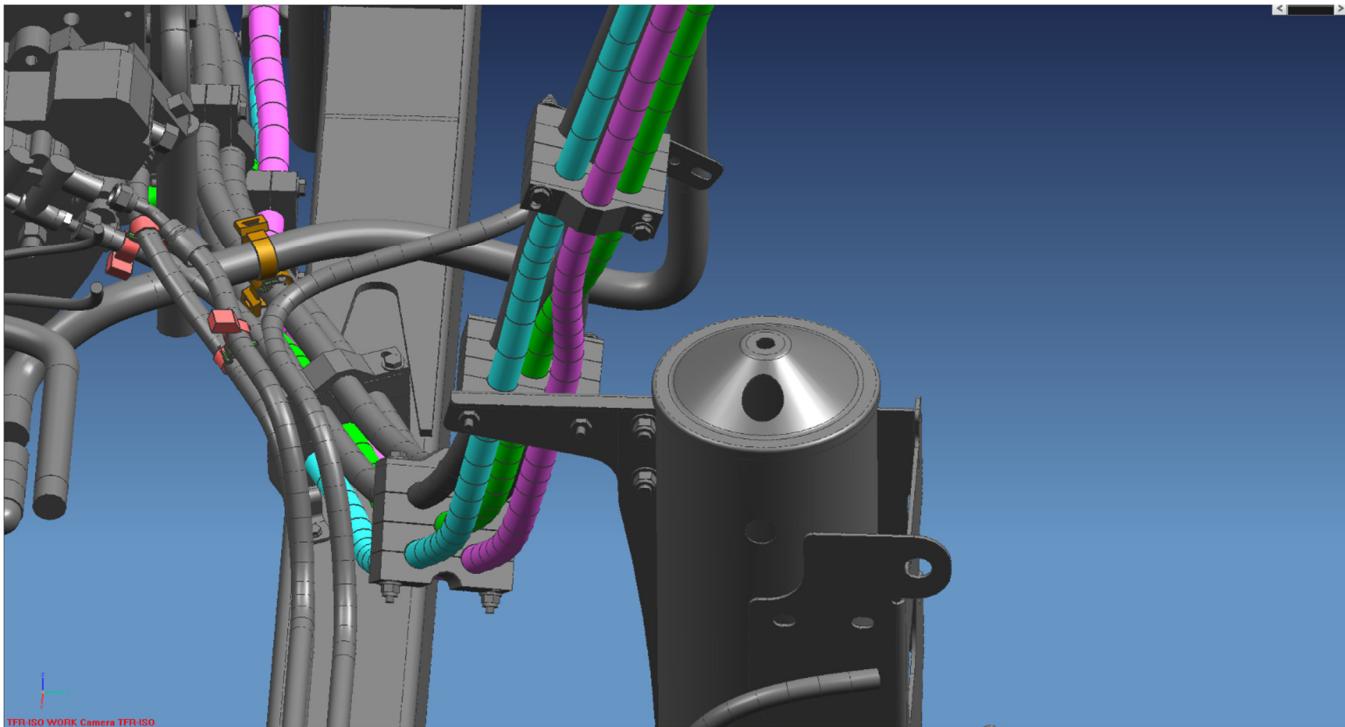


Routing thru Curbside Close Out Panel (Side View)

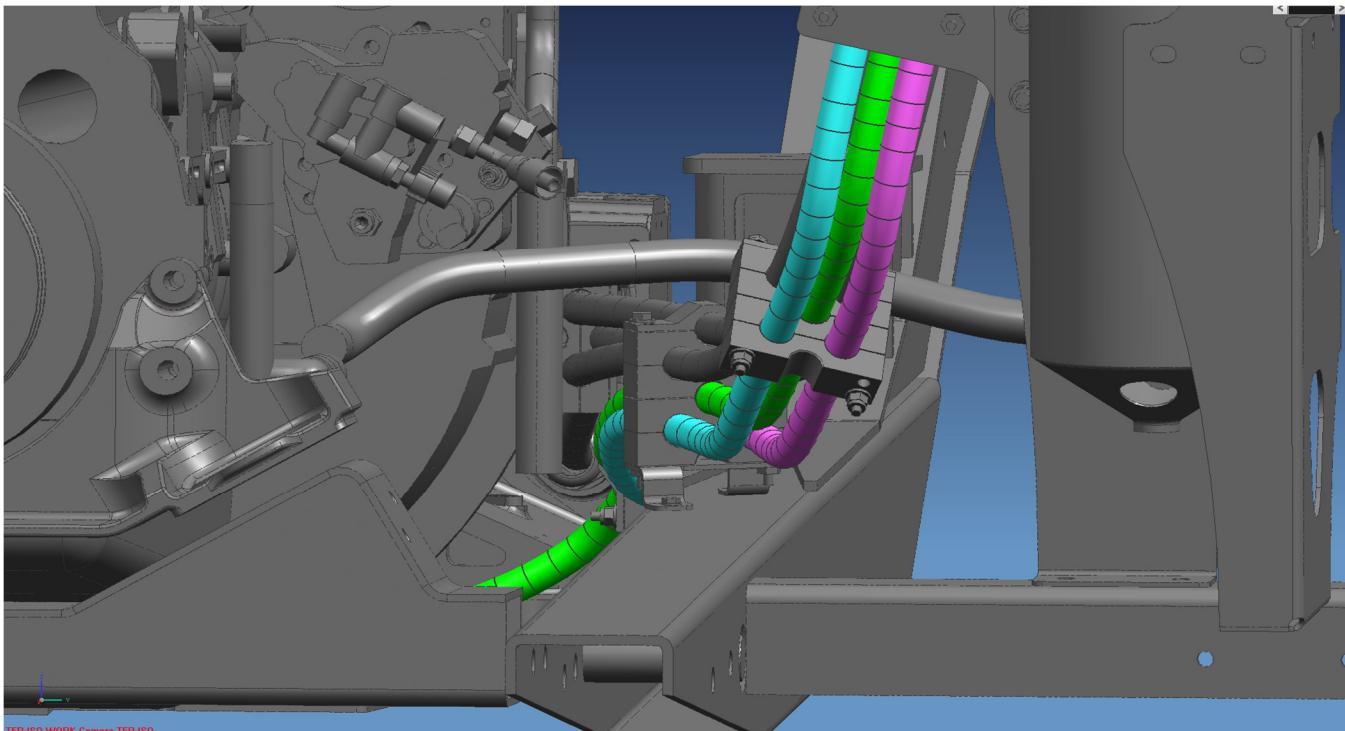


Routing thru Curbside Close Out Panel (Top View)

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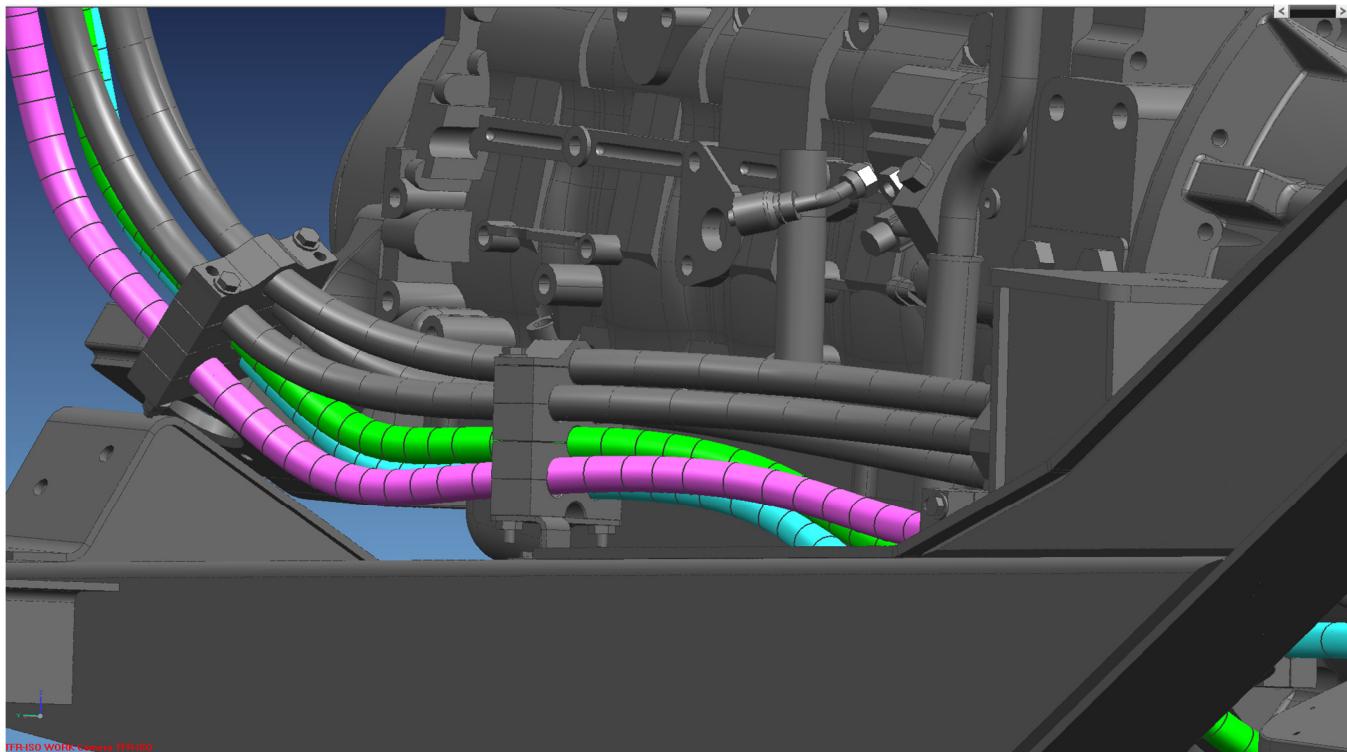


Routing to P/S Reservoir Bracket

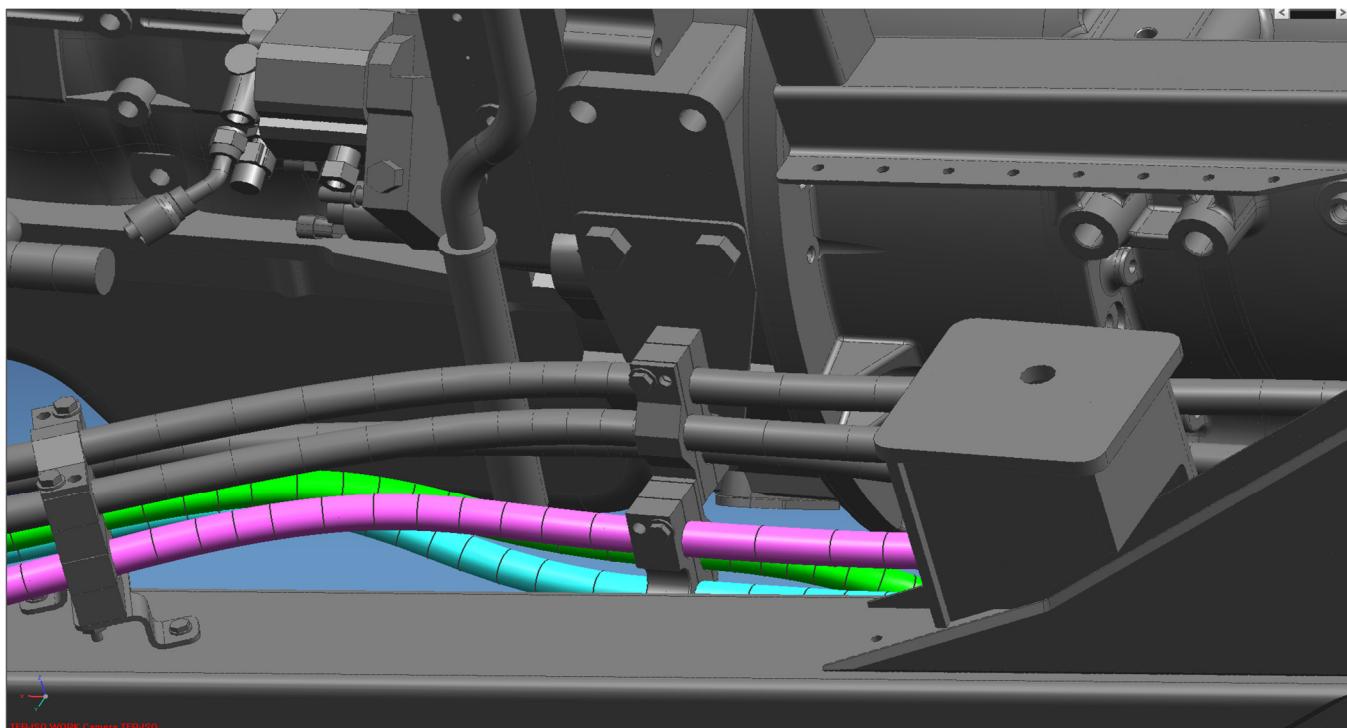


Routing thru Chassis Main Rail (Back View)

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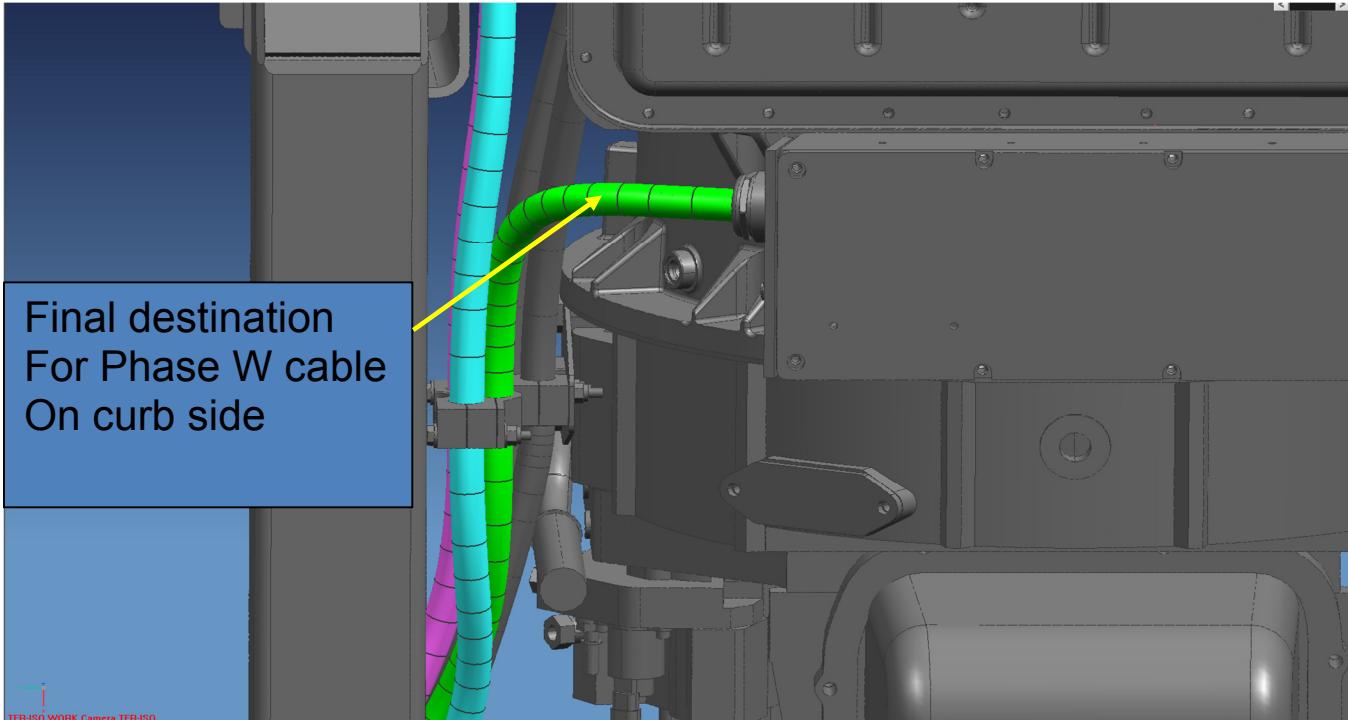


Routing thru Chassis Main Rail (Side View)

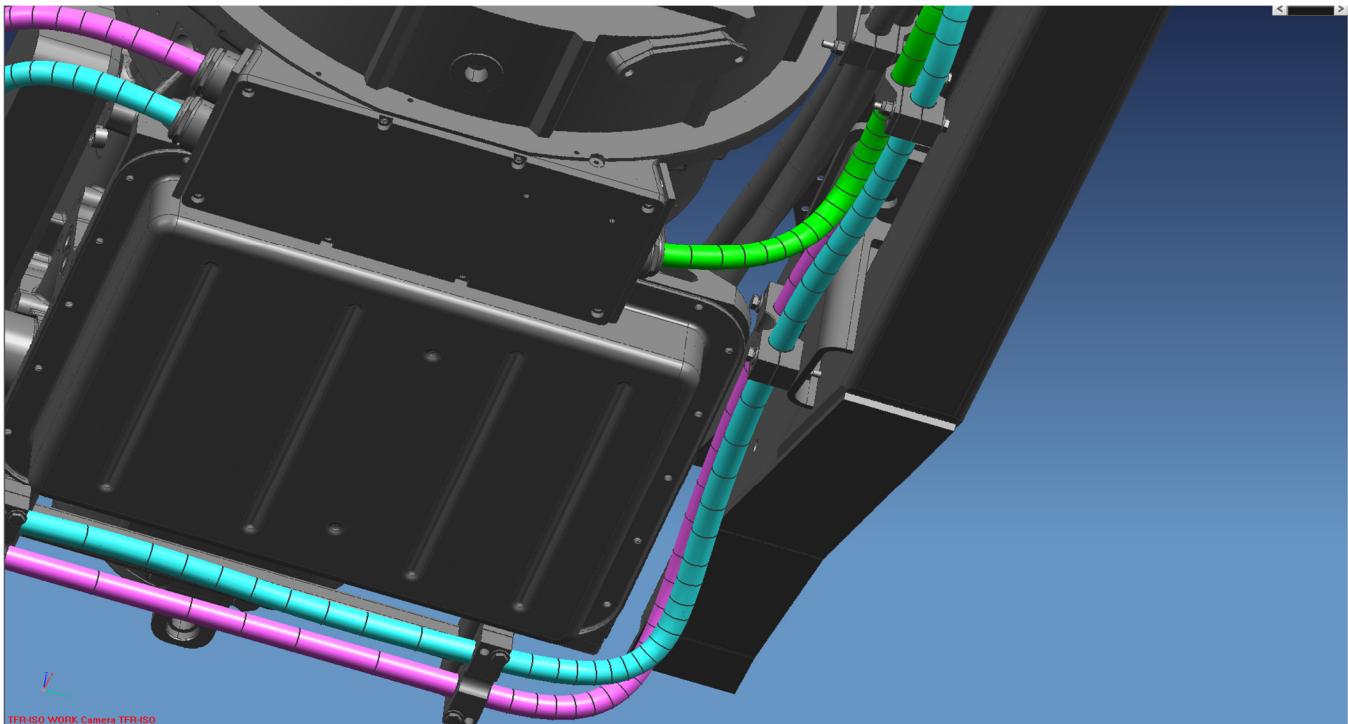


Routing thru Chassis Main Rail (Top View)

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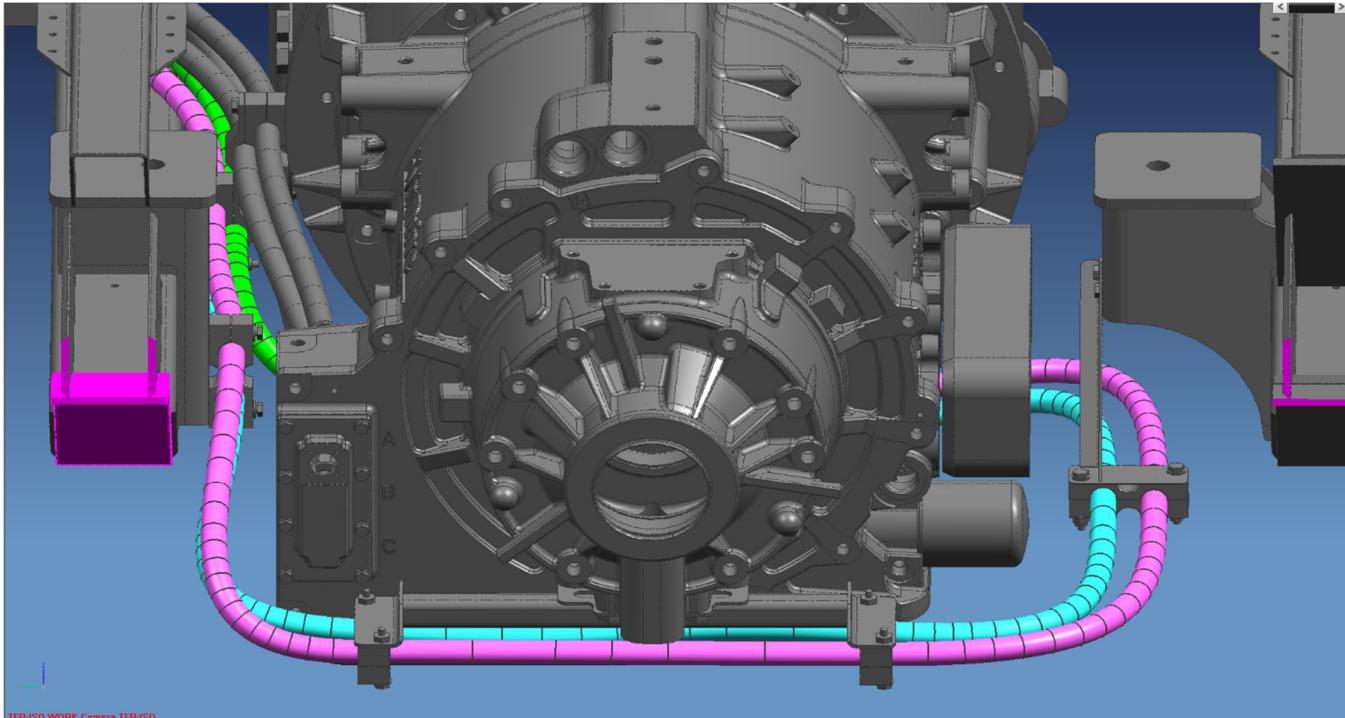


Phase W Routing into ISG

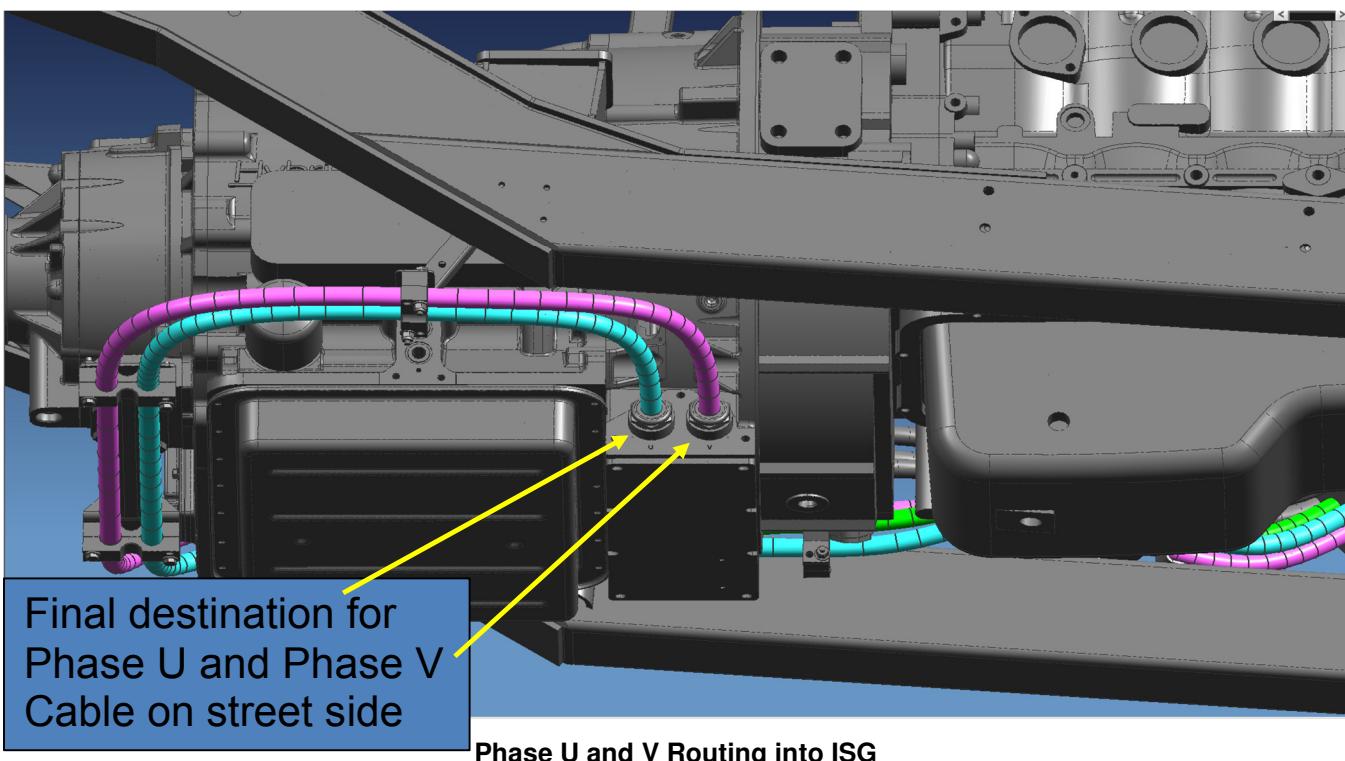


Routing Phase Cables around Transmission (Bottom View)

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Routing Phase Cables around Transmission (Rear View)



Phase U and V Routing into ISG

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APPENDIX A: Refer to attachment “BAE Hybrid Power Cables Installation.

LABOUR ESTIMATE				
	Operation	Men	Hours	Labour Time M X HR
1	Rework BAE HV PCS Cable Routing.	1	TBD	TBD

PARTS REQUIRED					
Item	Part Number	Description	Qty. per Coach	Units	Notes
1	092589	CLAMP-P 1.125	1	EA	
2	247225	CLAMP-P 0.813	1	EA	
3	247223	CLAMP-P 0.625	4	EA	
4	40N04000	NUT-HEX-LOCK-1/4	3	EA	
5	10B04012	BOLT-HEX 1/4 UNC X 0.75	3	EA	
6	400081	LUBE-O-RING SUPER O LUBE	0.01	EA	Source Locally
7	134336	ISPPROPYL -ALCOHOL	0.01	EA	Source Locally
8	10B04068	BOLT-1/4-20 X 4.25 LG		EA	AS REQUIRED
9	10W04000	WASHER FLAT 1/4		EA	AS REQUIRED
10	10B04056	BOLT-HEX 1/4 UNC X 3.50		EA	AS REQUIRED
11	261556	LOCKNUT-1/4-20 UNC TOP LOCK ST		EA	AS REQUIRED
12					